REMARKS

I. Rejections Under 35 U.S.C. 112

Page 2 of the office action states "[c]laims 8-14 and 18-21 are rejected under 35 U.S.C. 112 second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." Applicants respectfully traverse the rejection.

Regarding claim 8, the Examiner states on page 2 of the office action "[c]laim 8 recites the limitation 'a composition of indium in the light emitting layer' in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. The material of the light emitting layer in claim 1 from which claim 8 depends is not purported to comprise indium, and therefore it is not understood how the light emitting layer contains indium in claim 8." Rejection of claims for lack of antecedent basis is addressed in section 2173.05(e) of the Manual of Patent Examining Procedure, which states "the failure to provide explicit antecedent basis for terms does not always render a claim indefinite. If the scope of a claim would be reasonably ascertainable by those skilled in the art, then the claim is not indefinite." (Emphasis added.) Claim 8 is such a case. In claim 8, it is clear what is being referred to – indium composition – and it is clear where that indium composition is located – the light emitting layer. Since claim 8 makes clear the light emitting layer has an indium composition, the scope of claim 8 is reasonably ascertainable, and therefore claim 8 is not indefinite. Claims 9 and 10 depend from claim 8 and are therefore also not indefinite for the same reason as claim 8. Accordingly, Applicants respectfully request that the Examiner withdraw his rejection of claim 8-10 for lack of antecedent basis.

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Regarding claims 11 and 12, the Examiner states on page 2 of the office action "[c]laims 11 and 12 recite the limitation 'a composition of aluminum in the light emitting layer' in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. The

material of the light emitting layer in claim 1 from which claims 11 and 12 depend is not purported to comprise aluminum, and therefore it is not understood how the light emitting layer contains aluminum indium [sic] in claims 11 and 12." Since claims 11 and 12 do not recite indium, Applicants assume the Examiner's inclusion of indium in the last line of the quoted rejection is an error. The above analysis of claim 8 may be applied to claims 11 and 12. As in claim 8, claims 11 and 12 make clear the light emitting layer has an aluminum composition, thus the scope of claims 11 and 12 is readily ascertainable, and claims 11 and 12 are therefore not indefinite. Claims 13 and 14 depend from claim 12 and are therefore also not indefinite for the same reason as claim 12. Accordingly, Applicants respectfully request that the Examiner withdraw his rejection of claims 11-14 for lack of antecedent basis.

Regarding claims 18-20, the Examiner states on page 3 of the office action "[c]laims 18-20 recite the limitation 'first and second cladding layers' in lines 1-2. There is insufficient antecedent basis for this limitation in the claim. First and second cladding layers were not previously referred to in claim 15 from which claims 18-20 depend." Claim 18 recites "[t]he device of claim 15 further comprising first and second cladding layers, wherein the active region is disposed between the first and second cladding layers." Claims 19 and 20 are amended to depend from claim 18. Applicants respectfully request that the Examiner withdraw his rejection of claims 18-20 for lack of antecedent basis.

Regarding claim 21, the Examiner states on page 3 of the office action "[c]laim 21 recites the limitation 'a composition of indium in the light emitting layer' in lines 1-2." **Actually, claim 21 contains no such recitation.** The Examiner is respectfully requested to clarify or withdraw his rejection of claim 21 for lack of antecedent basis.

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II. Rejections Under 35 U.S.C. 103

Claims 1-5, 15, 18, 19, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata et al., US 2003/0057434 A1 (hereinafter "Hata") in view of Sun et al.

"Polarization anisotropy of the photoluminescence of M-plane (In,Ga)N/GaN multiple quantum wells" (hereinafter "Sun"). Applicants respectfully traverse the rejection.

As the Examiner is aware, the requirements of a prima facie case of obviousness of a claim are addressed in section 2143 of the Manual of Patent Examining Procedure, which states "[t]o establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." Applicants respectfully submit that the Examiner has failed to provide both a motivation to combine Hata and Sun and a reasonable expectation that Hata and Sun may be successfully combined.

A. Motivation to Combine

Regarding the motivation to combine, the Examiner states on page 4 of the office action:

> Hata et al. does not disclose a <0001> axis being substantially parallel to a top surface of the light-emitting layer. . . . Sun et al. teaches in page 3850, right column, lines 9-17 the light emitting layer is <1120> layer. Therefore, Sun et al. discloses a <0001> axis being substantially parallel to a top surface of the light-emitting layer. In view of such teaching, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hata et al. by having a <0001> axis being substantially parallel to a top surface of the light emitting layer to increase the polarization degree in the light emitting layer (page 3850, right column, line 1-2).

Sun teaches that the "polar c-axis . . . is the common growth direction of [wurtzite GaN and related compounds] . . . ." (Sun, page 3850, column 1, lines 5 and 6). Sun deals with GaN films grown in another, uncommon growth direction, particularly "M-plane (In,Ga)N/GaN" (Sun, page 3850, column 1, line 38 to column 2, line 1), which Sun describes as a "direction[] perpendicular to the c-axis . . . ." (Sun, page 3850, column 1, lines 15 and

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16). Such a structure may possess a "polarization degree . . . as high as 96% . . . ." as noted by the Examiner in his rejection. However, the Examiner does not provide a *reason* why it is desirable for Hata's device to have, as the Examiner puts it, an increased polarization degree in the light emitting layer. Thus, the Examiner has failed to explain why increasing "the polarization degree in the light emitting layer" motivates a person of skill in the art to combine Hata with Sun.

In addition, Hata states at page 1, paragraph 14, "[a]n object of the present invention is to provide a semiconductor device having superior device characteristics obtained by improving the crystalline quality of a device-constituting layer composed of a nitride semiconductor and a method of fabricating the same." Specifically, Hata attempts to achieve improved crystalline quality by reducing the number of defects in the device. See, for example, Hata's paragraph 16 on page 1, which states "the number of defects existing in the second buffer layer is smaller than that in a buffer layer in an amorphous or polycrystalline state, so that the second buffer layer has good crystalline quality." As stated in Sun, the c-axis is the common growth direction for GaN-based devices. A person of skill in the art would expect growth along the common growth direction to result in higher quality material than growth along other directions. Accordingly, growth of some of the layers in Hata's device along Sun's uncommon growth direction, as proposed by the Examiner, may result in a device with more defects, defeating Hata's object. A person of skill in the art thus would not be motivated to combine Hata with Sun.

B. Reasonable Expectation of Success

Hata's paragraph 15 on page 1 recites that Hata's device includes "a substrate; a first buffer layer in a non-single crystalline state; a second buffer layer in an approximately single crystalline state composed of a nitride containing neither Ga nor In; and a device-constituting layer composed of a nitride semiconductor in this order." Thus, Hata's device layers are

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grown over a non-single crystal layer. A person of skill in the art would expect that any III-nitride layer grown over Hata's non-single crystalline layer would revert to growing along the c-axis, (i.e., the common growth direction mentioned by Sun), and would not grow as Sun's structure, which is grown along an axis perpendicular to the c-axis. Accordingly, a person of skill in the art would have no expectation that Hata and Sun can be successfully combined to result in a device with the <0001> axis substantially parallel to a top surface of the light emitting layer, as proposed by the Examiner.

Since the Examiner has failed to provide a motivation to combine Hata and Sun and a reasonable expectation of the success of making such a combination, the Examiner has failed to provide two of the three requirements of a prima facie case of obviousness. Applicants respectfully submit that claim 1 is allowable over Hata and Sun.

C. Dependent claims

Claims 2-5, 15, 18, 19, 22, and 23 depend from claim 1 and are therefore allowable over Hata and Sun for at least the same reasons as claim 1. In addition, regarding claims 22 and 23, Applicants have found no teaching in either Hata or Sun of operation "at a current density greater than 10 A/cm^2" as recited in claim 22, or of operation "at a current density greater than 100 A/cm^2" as recited in claim 23.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hata and Sun and further in view of Goetz et al., US 2002/0171092 A1 (hereinafter "Goetz"). Claim 7 depends from claim 1. Goetz is cited relative to a claim element unrelated to the deficiencies of Hata and Sun with respect to claim 1. Claim 7 is thus allowable over Hata, Sun, and Goetz for at least the same reason claim 1 is allowable over Hata and Sun. In addition, Applicants respectfully disagree with the Examiner's position on page 5 of the office action that "GaInN and AlInGaN are recognized in the art as equivalents" and respectfully request that the Examiner supply some support for this assertion.

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Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata and Sun and further in view of Ibbetson et al., US 6,515,313 (hereinafter "Ibbetson"). Claims 8-10 depend from claim 1. Ibbetson is cited relative to claim elements unrelated to the deficiencies of Hata and Sun with respect to claim 1. Claims 8-10 are thus allowable over Hata, Sun, and Ibbetson for at least the same reason claim 1 is allowable over Hata and Sun.

Claims 11-14, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata and Sun and further in view of Bour et al., US 2003/0020085 A1 (hereinafter "Bour"). Claims 11-14, 16, and 17 depend from claim 1. Bour is cited relative to claim elements unrelated to the deficiencies of Hata and Sun with respect to claim 1. Claims 11-14, 16, and 17 are thus allowable over Hata, Sun, and Bour for at least the same reason claim 1 is allowable over Hata and Sun.

Applicants thank the Examiner for indicating that claim 6 is allowable if rewritten in independent form.

In view of the above arguments, Applicants respectfully request allowance of claims 1-23. Should the Examiner have any questions, the Examiner is invited to call the undersigned at (408) 382-0480.

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R Leiterman 1/12/06

Signature Date

Respectfully submitted,

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